FEASIBILITY STUDY and SITE DESIGN

for the PRESERVATION of WESTLAKE AREA

SWAMP/WETLANDS

as part of the implementation of the

PENNSYLVANIA COASTAL ZONE MANAGEMENT PROGRAM

PREPARED FOR:

PENNSYLVANIA COASTAL ZONE MANAGEMENT PROGRAM

PREPARED BY:

MILLCREEK TOWNSHIP SCHOOL DISTRICT

July 30, 1982

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PENNSYLVANIA COASTAL ZONE MANAGEMENT PROGRAM

PREPARED FOR:

ERIE COUNTY DEPARTMENT of PLANNING

PREPARED BY:

MILLCREEK TOWNSHIP SCHOOL DISTRICT

July 23, 1982

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I. Introduction

With new energy sources and alternatives being investigated, building, and development taking place close by, it is an environmental priority to preserve the natural habitat of the lake area.

Westlake Middle School is rapidly becoming an alternate energy site with a natural gas well while wind and solar energy systems are being explored.

The wetlands area adjacent to Westlake is owned by a building contractor. Housing developments are possible in the near future.

We, at Millcreek School District, felt it was important to involve our students in a study to investigate the liklihood of preserving the wetlands area from an environmental stand point. The study would indeed cause students to apply their course work to a real immediate problem solving situation that they could impact.

ACKNOWLEDGMENT

We would like to deeply thank the following Millcreek students for devoting their time, and especially their efforts to seeing that this project could be a major success.

1. Melissa Sanders
2. Michele Clingerman
3. Michele Buckovich
4. Angel Wyler
5. Jon Patterson
6. Paul Flak

Barry Robinson, Instructor
Ed Lindberg, Instructor
Shelley Ford, Coordinator

II. Purpose of the Project

The purpose of the project was to enhance coastal resources by conducting a feasibility study for site design to preserve coastal features and habitat areas. By investigating the wetlands behind Westlake MIddle School, students were able to identify types of flowers, trees, mammals and other organisms. An outdoor laboratory served as the project center. After identification of the flora and fauna, students investigated the area for rare, endangered, and/or threatened species. Man-made and natural variables that threaten the natural balance of the coastal habitat were also studied. A site design was developed which ensured preservation of the natural habitat area. As an ongoing final product, a videotape was developed to sensitize cable television viewers to environmental education and the scope of the project as it progressed.

The time frame for this study was approximately twelve (12) months. The study involved Westlake Middle School students, teachers and local consultants. The necessary tasks that were completed are outlined in the following three phases. Implementation of recommended site design will be completed in year two.

PHASE I - INVESTIGATION

A. Outdoor research laboratory assembled and supplied
B. Teachers and students investigate trees, flowers, and animals
C. Videotape developed by students, teachers and media specialist

PHASE II - IDENTIFICATION

A. Rare, endangered, and/or threatened species in the lake area identified
B. Man-made and natural variables threatening the natural habitat identified
C. Videotape developed by students, teachers, media specialist

PHASE III - PRESERVATION SITE DESIGN

A. Site design and alternatives developed
B. Implementation plan outlined
C. Videotape developed

III. Procedure

A. Investigation and Identification

The study of the Westlake wetland began in March of 1982. A group of 30 8th grade students were chosen to conduct the basic study. The group began their investigations by establishing a basic work area by using aerial photographs taken of the study area. After establishing a basic work area the group dealt with the best means by which to come up with an overall study of the area. It was decided that the best approach would be to establish random quadrants through out the study zone and obtain as complete of an overview as possible from the area.

In the study of each of the quadrants, groups of four students carried out a number of activities, regarding the identification of all flora and fauna found within their quadrant.

ECOLOGICAL STUDY OF A QUADRANT PROCEDURE

1. Location: State_____ County_____

   Town _____

   Property of_____

2. Description:
   a. Size of Quadrant_____
   b. Weather Conditions_____
   c. Is the land flat or does it slope? _____

      _____
   d. What is the major plant cover? _____

      _____
   e. What kinds of rock can be found? (Take a sample of one of each kind.)

      _____

Ecological Study of A Quadrant Procedure (cont.)

3. Soil profile diagram: Depth Profile

4. Water Absorption Rate: (Measured in inches from top of can)

   a. End of first minute_____ End of fourth minute_____

   b. End of second minute_____ End of fifth minute _____

   c. End of third minute _____ End of tenth minute _____

5. Dig to a depth of three inches in one square foot of the quadrant. How many different kinds of plants and animals are found both on and under the surface in the quadrant?

PLANTS_____ ANIMALS_____

(List three or more) (List three or more)

_____ _____

_____ _____

_____ _____

_____ _____

6. Collect a container of soil from your quadrant for later study in the classroom, Take a sample which includes litter and humus. Dig to a depth of at least six inches.

7. General questions about the area:

   a. What are the natural resources found in the area?

   b. How has man affected the land?

   c. How do man and the animals use the local trees and plants?

   d. What kinds of birds are there in the area?

   e. What kinds of insects are there in the area?

   f. Is there enough food for the animals? How can you tell?

Also included in the investigation was one group of 6 students who dealt only with transit organisms (Birds, Mammals, Amphibians, Reptiles) that could be found through out the basic study area. There was a third investigative group involved with the basic study of the area, that dealt totally with the chemical analysis of the water and soil found within the area.

The main emphasis of the water study was focused on the basic conditions of the habitat and the involvement of any pollution problems that could be possibly affecting the area. The test conducted during the study were as follows:

Dissolved Oxygen, CO_2 , Ph , Alkalinity, Ammonia, Calcium, Chlorides, Magnesium, Manganese, Nitrates, Phosphates, Silica, and Sulfides

The group also conducted some basic oil tests regarding the

JEWELWEEDS (TOUCH-ME-NOTS)

There are 2 varieties of this species found in this area, they are the Spotted and Pale.

These plants are very interesting for two basic reasons. The first is due to the fact that Jewelweed is nature's answer to poison ivy cure. By taking the plant and crushing it to produce a juice it can be then applied to the areas of the body where poison ivy has been contacted. The second point is that this plant can be used by biologist to demonstrate how plants transport water upward through the plant. This is due to the translucent stem of this plant.

CATTAILS

Cattails can be considered nature's potato patch. The rootstock of the plant can be used in salads or as we normally use potatoes. Leaves are valuable for matting and thatching. Cattail marshes provide excellent cover for waterfowl but their growth hinders the growth of plants that waterfowl use as food.

STAGHORN SUMAC

This plant is easily identified by its furry twigs and leaves. The plant also produces large compact groups of berries that are red in color. The Indians used the berries to produce a beverage. It is created by boiling the berries in water and then sweetening the beverage with sugar.

WILD ROSE BUSH

Provides beauty and game cover. Rose hips are a good food source for many birds and mammals. Jellies can be made from the hips usually after a frost.

GARDEN ASPARAGUS

Here we have an escapee from someone's domestic garden. The seeds of this plant were probably deposited here by a bird and the seeds began to develop. The species is an edible vegetable during the spring, when the new shoots are just beginning to emerge from the soil.

SENSITIVE FERN

The name of this plant may come from the fact that it wilts quickly when cut or touched by frost.

The yellowish or bluish green fronds are sterile. The fertile fronds are produced in late summer and may produce spores for 2 years or more.

EROSION

Water is a vital element for all life forms, but can also be the source of a great deal of damage. As water in the stream gather more velocity it is able to carry more material; eventually carving a deep gully in the landscape.

DUCKWEED

Duckweed is a tiny floating herb. It is a favorite food for water fowl. Duckweed is the smallest seed plant known. These plants reproduce mainly by division of the leaflike plant body.

BUR REED

These plants are a close relative of the Cattail and can be found in marshes through out the United States. They are of importance mainly in the feeding of wildlife. They produce seeds which are relished by various waterfowl, while the leaves of the plant are favored by muskrats and surprisingly deer.

POISON IVY

Probably one of the worst weeds because it is a contact poison causing an itchy rash on anyone susceptible. Can be found as an upright shrub or a vine. When found as a shrub it is called Poison Oak. The flowers of this plant produce a cluster of white berries. Areas of the body that come in contact with the plant should be thoroughly washed, rinsed and dried. Jewelweed juice can bring relief from poison ivy.

SCOT'S PINE

Scot's Pine is easily recognized by the large amount of reddish-orange colored bark visible in the trunk and stem. Needles are in groups of 2 with a twist to each needle. Needles grow to 3" in length. Most important timber tree of Europe. In America its chief use is as a quick growing cover and soil anchor.

TULIPTREE or YELLOW-POPLAR

The yellow-poplar is a tree of ancient lineage. The tuliptree goes back to fifty million years ago. Fossil leaves have been found in rocks of Europe and Greenland. The Tuliptree grows tall, its straight trunk free of branches near the ground, may reach as much as 200'. It's fruit supplies many animals with their winter food supply.

quality of the soil. These tests included: Nitrogen, Phosphorus, Potash, and Ph.

The project continued on with the holding of a two week summer workshop from July 6 - July 16. The purpose of the workshop was to complete the findings started during the school year, and then to develop a design for preserving the area as a basic natural environment. The students created the basic plan for the area by using a simple mapping technique of using a compass and steel tape. Once readings and distances were taken they were then plotted on a final map. After establishing the basic area of the design the students chose some basic points of interest they wanted to highlight in the area and then created a trail within the area which could incorporate all their desired points. They completed the trail on the map by using the same techniques as they used to create their map

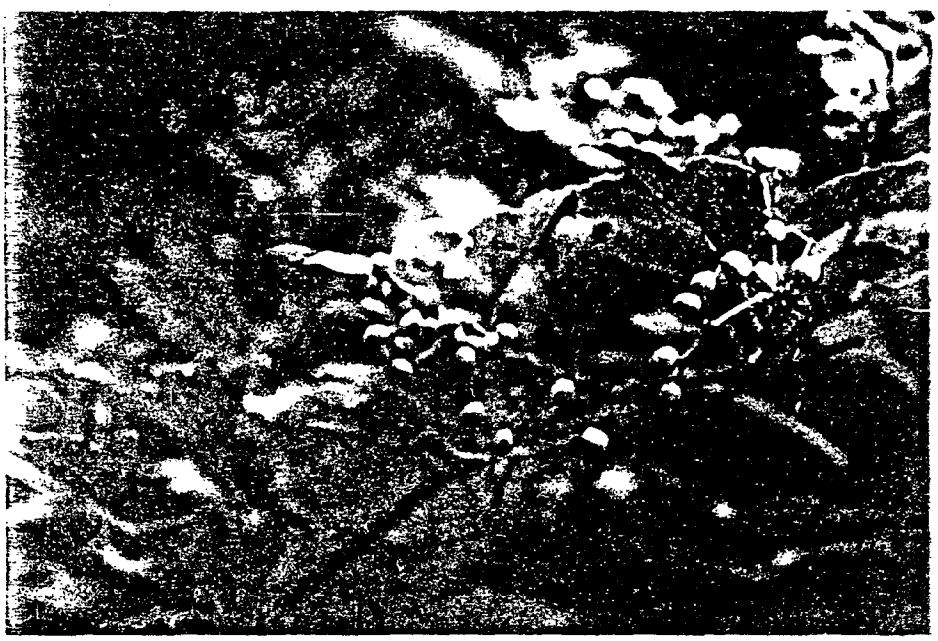
After completing their over all map of the area the students wrote trail cards explaining each of their points of interest found along the trail. Examples of these cards can be found within this report.

B. Preservation of Site Design

According to the results of the various student investigations the area was found to be a typical wetlands environment indiginous to Northwestern Pennsylvania. Dense vegetation is present through out the year. A variety of marsh found commonly appeared: cattails, burreed and duckweed. Marginal vegetation which can adapt to both wet and semi-moist conditions would involve sedges, sensitive ferns and willows. Secondary growth plants were present in the dryer areas of the area: cottonwoods, sumac, poison ivy, and jewelweed. A plantation situation was also found in the wetlands where man planted Scot's Pines and Blue Spruce trees.

The following photographs are examples of the different types of plant life found in the area.

HIGH BUSH CRANBERRY
SEC. GROWTH



BUCKTHORN
SEC. GROWTH

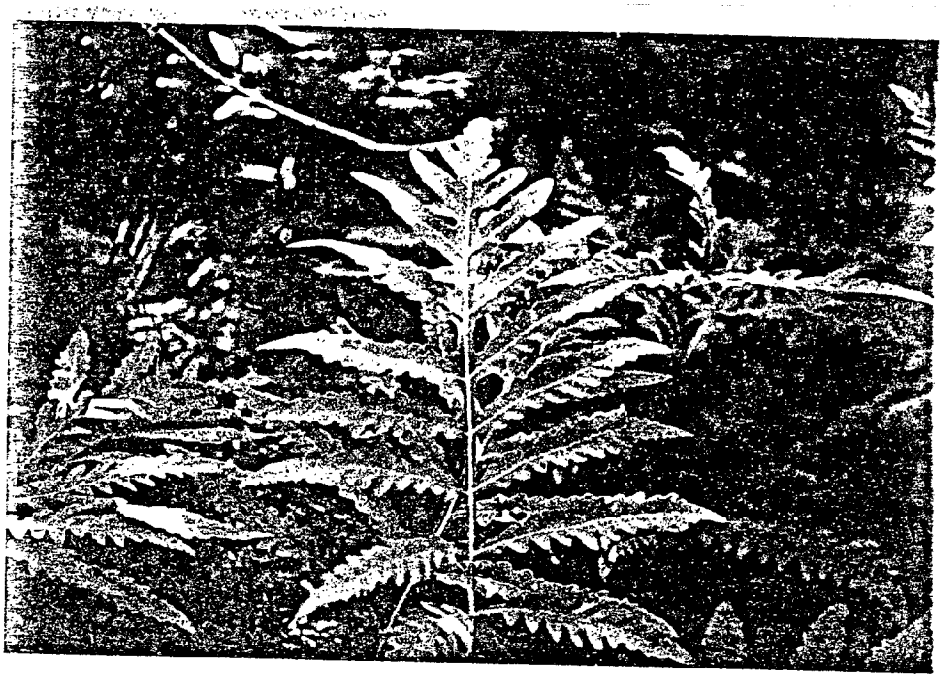
RED OSIER DOGWOOD
SEC. GROWTH

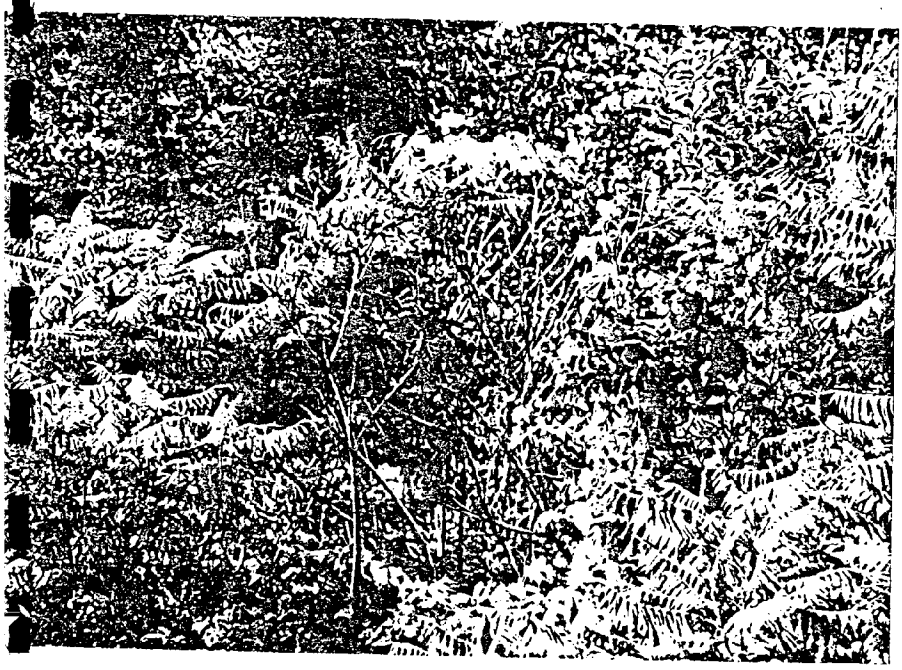
RED MAPLE WITH INSECT GALLS
SEC. GROWTH

POISON IVY
SEC. GROWTH

MILKWEED
SEC. GROWTH

SENSITIVE FERN
MARGINAL





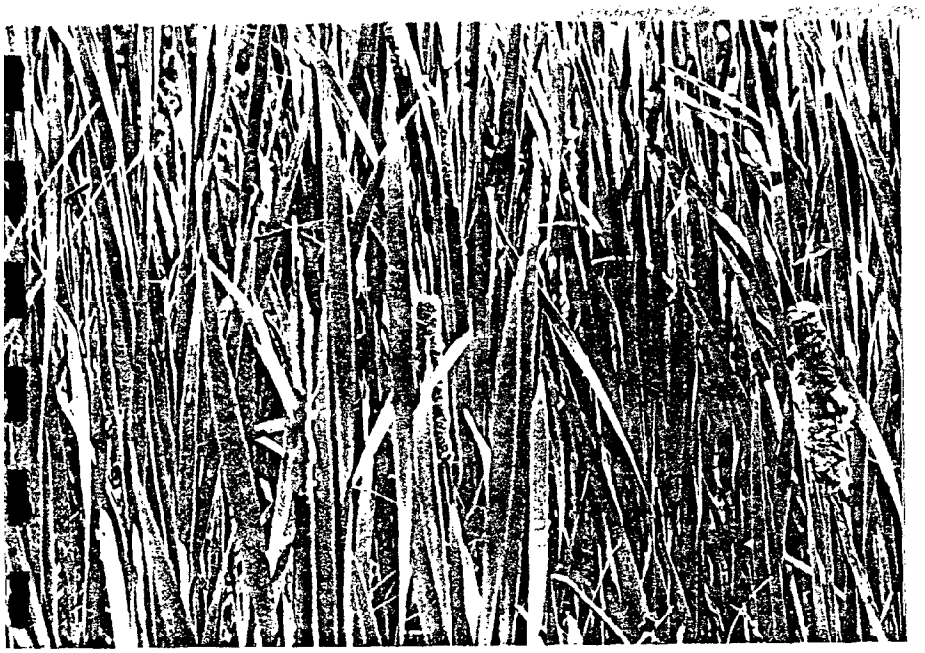
STAGHORN SUMAC
SEC. GROWTH

NIGHT SHADE
SEC. GROWTH

BEAK RUSHES
MARGINAL

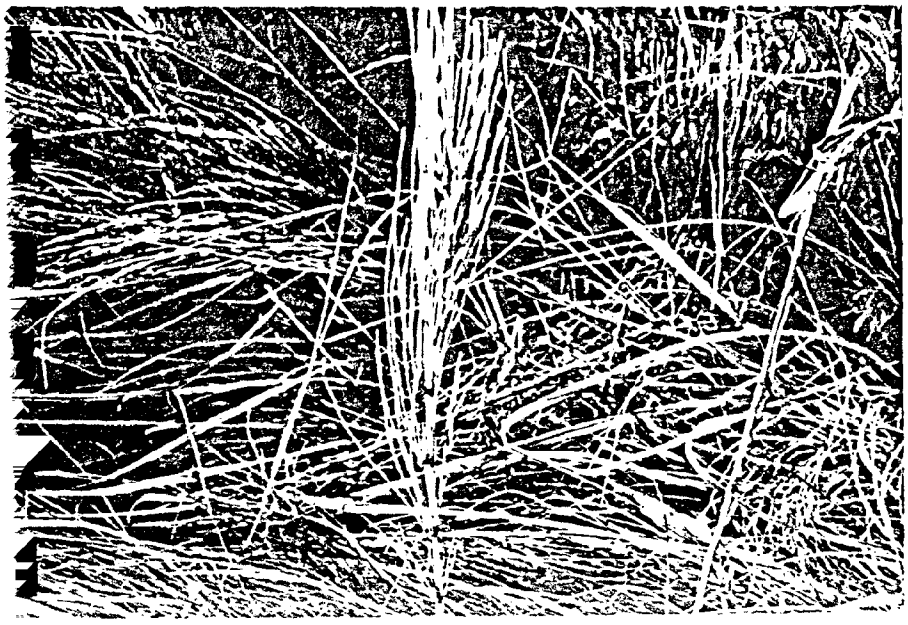
JEWELWEED
MARGINAL

BEAK RUSHES
LATER DEVELOPMENT

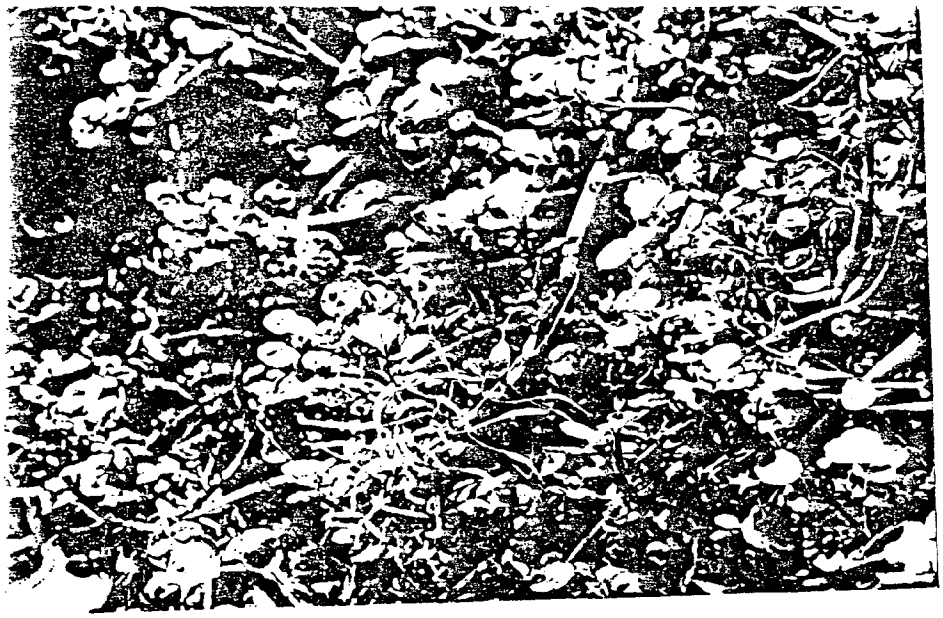


CATTAIL MARSH

BLACK WILLOW
MARGINAL

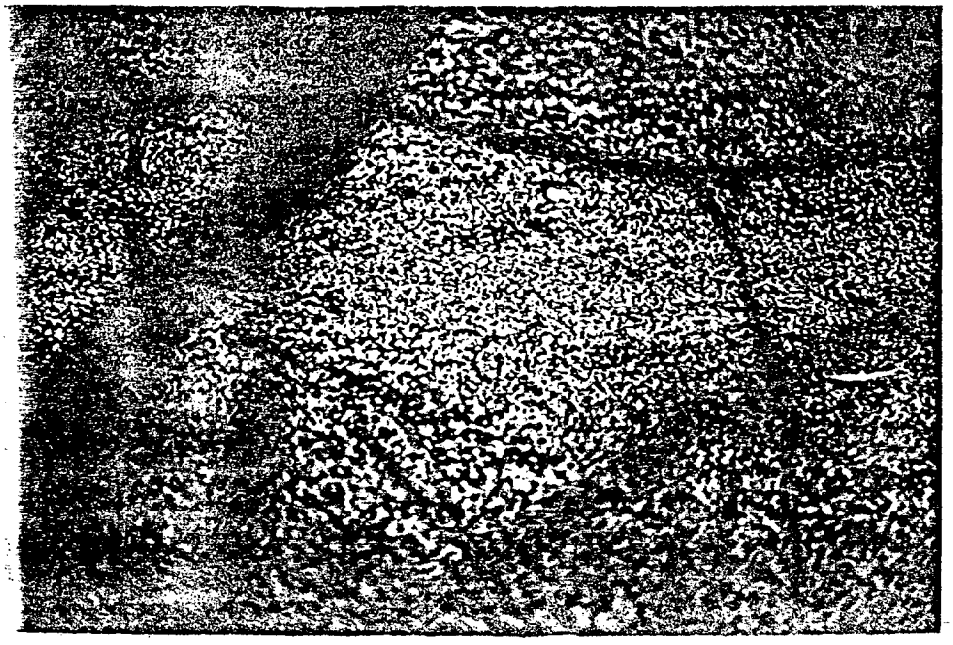


HORSETAIL
MARGINAL



WATER CRESS
MARSH

BURREED
MARSH



DUCKWEED
MARSH

The following is a list of transit organisms found within the study area.

MAMMALS

1. whitetail deer
2. star nosed mole
3. skunk
4. white-footed deer mouse
5. eastern cottontail
6. raccoon
7. oppossum

BIRDS

1. ruffed grouse
2. kill deer
3. robin
4. common grackle
5. red-winged blackbird
6. cardinal
7. american goldfinch
8. field sparrow
9. song sparrow
10. house sparrow
11. eastern meadowlark
12. white-breasted nuthatch
13. black-capped chickadee
14. blue jay
15. purple martin
16. least flycatcher
17. starling
18. mourning dove

BIRDS (cont.)

19. tricolored blackbird
20. slate-colored junco

AMPHIBIANS

1. red salamander
2. leapard frog
3. green frog
4. american toad
5. spring peeper

REPTILES

1. garter snake
2. dekay snake

As a part of the total investigation of the environment the students completed some basic soil tests. The purpose of the tests were to find out the quality of the soils, and to observe if that quality was affecting in anyway the plant growth in the area. The students first determined the pH of the soil, which was found to be 5½. Then tests for nitrogen were conducted. The soil was found to contain 4% nitrogen. Tests for phosphorus and potash were also completed. The results here showed levels of 12% phosphorus and 18% potash. From the results one can determine that the soils of this area are above average in regards to fertility and could support a wide variety of plant growth.

This information shall be used when determining the types of plants that can be used to refurbish this area. The data was also used in determining the plants that were used to camoflouge the natural gas well.

IV. Outcomes/Recommendations

A. Site Design

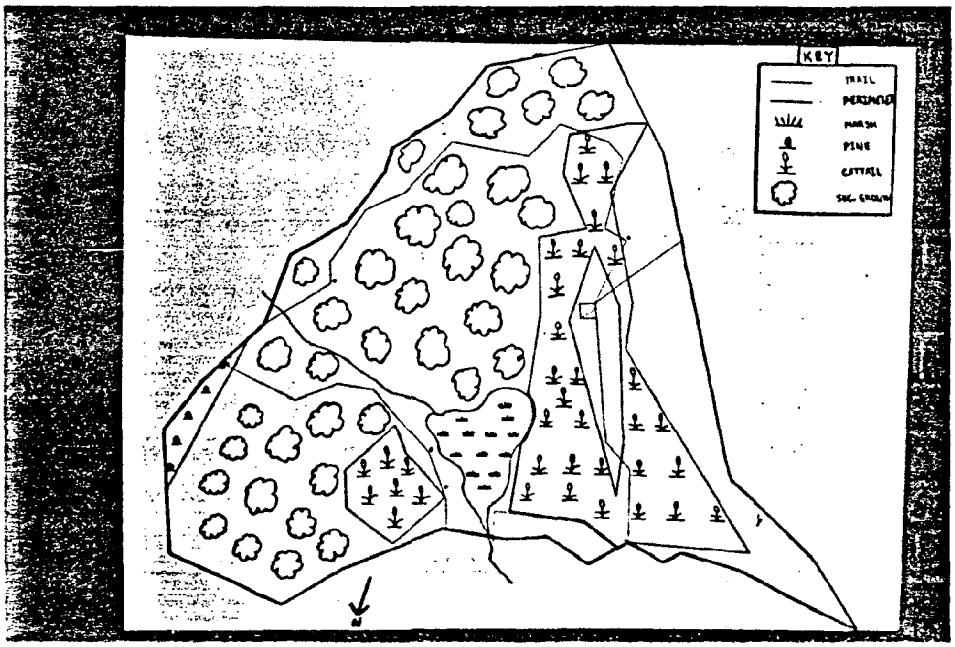
After the wetlands area was investigated and the habitat identified a basic lay out of a nature area was developed. The plan will be put into operation within a year including all Westlake property and will be expanded to its full extent upon permission from the adjacent land holder.

There are nine stations along the trail design that indicate various points of interest through out the four major areas of vegetation. The trail, was designed to incorporate all the different elements of the habitate found within the perimeter of the designated area.

The trail will be cut to approximately four feet in width and constructed of bark and corduroy road.

The nature area will be used for educational purposes for middle school students and any other interested community group such as Audubon.

WESTLAKE WETLANDS TRAIL DESIGN



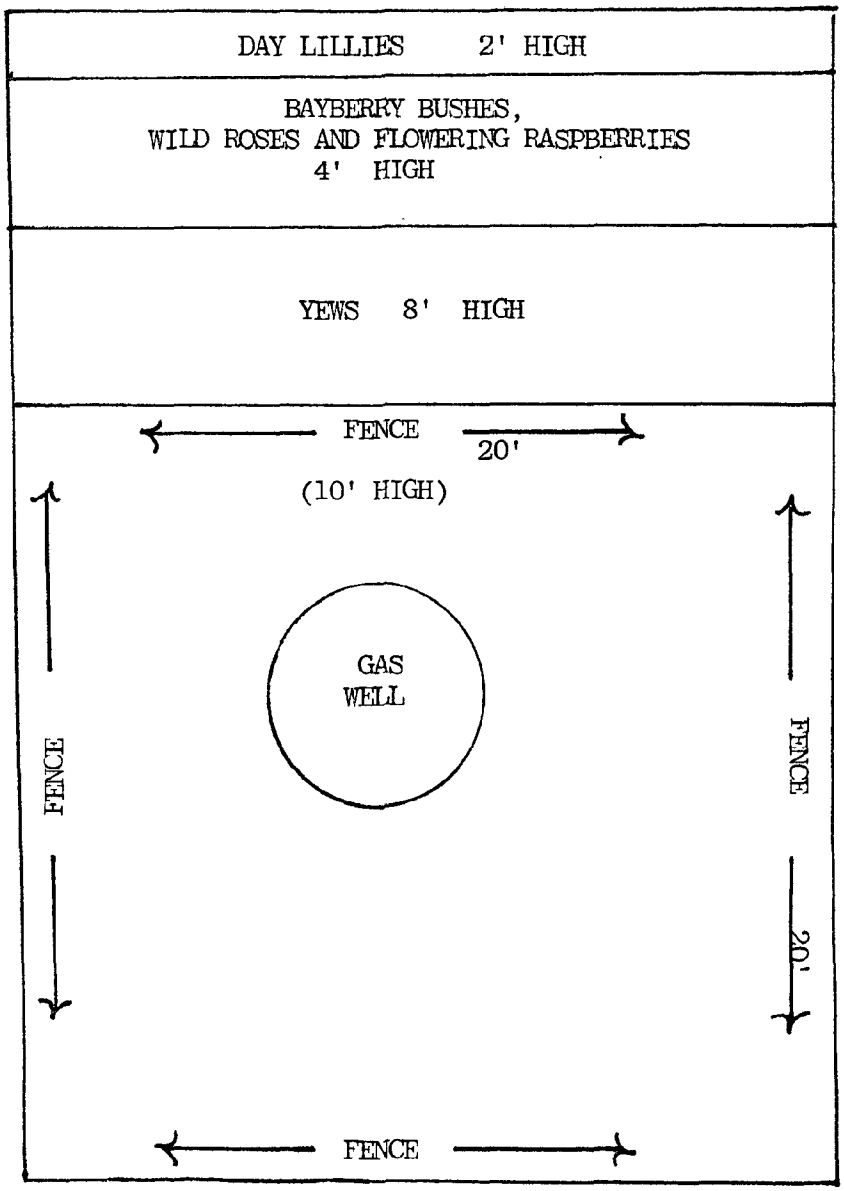
SCALE 1/16" = 1'

B. Gas Well Camouflage Plan

In the fall of 1981 Millcreek School District drilled a natural gas well (medina level) based upon recommendations from a study completed by DOE and Monsanto Corporation. The well is located at Westlake Middle School adjacent to the wetlands, approximately 100 feet west of the area.

With new energy sources and alternatives being, investigated, it is an environmental priority to preserve the natural habitat. One outcome of this project was to develop a plan to camouflage or alter the physical presence of the gas well to complement the environment.

The following diagram illustrates a plan to use plants indigenous to the area for maintaining a year round ground cover.



The plants will be planted on all sides of the well.

Yews are evergreens and as a result would cover the entire fence year round. They would also supply shelter for nesting birds and small mammals.

Wild roses, flowering raspberries, and bayberry bushes would provide food for birds and mammals. They would also add color and fragrance to the camouflage and remain in bloom for approximately five months.

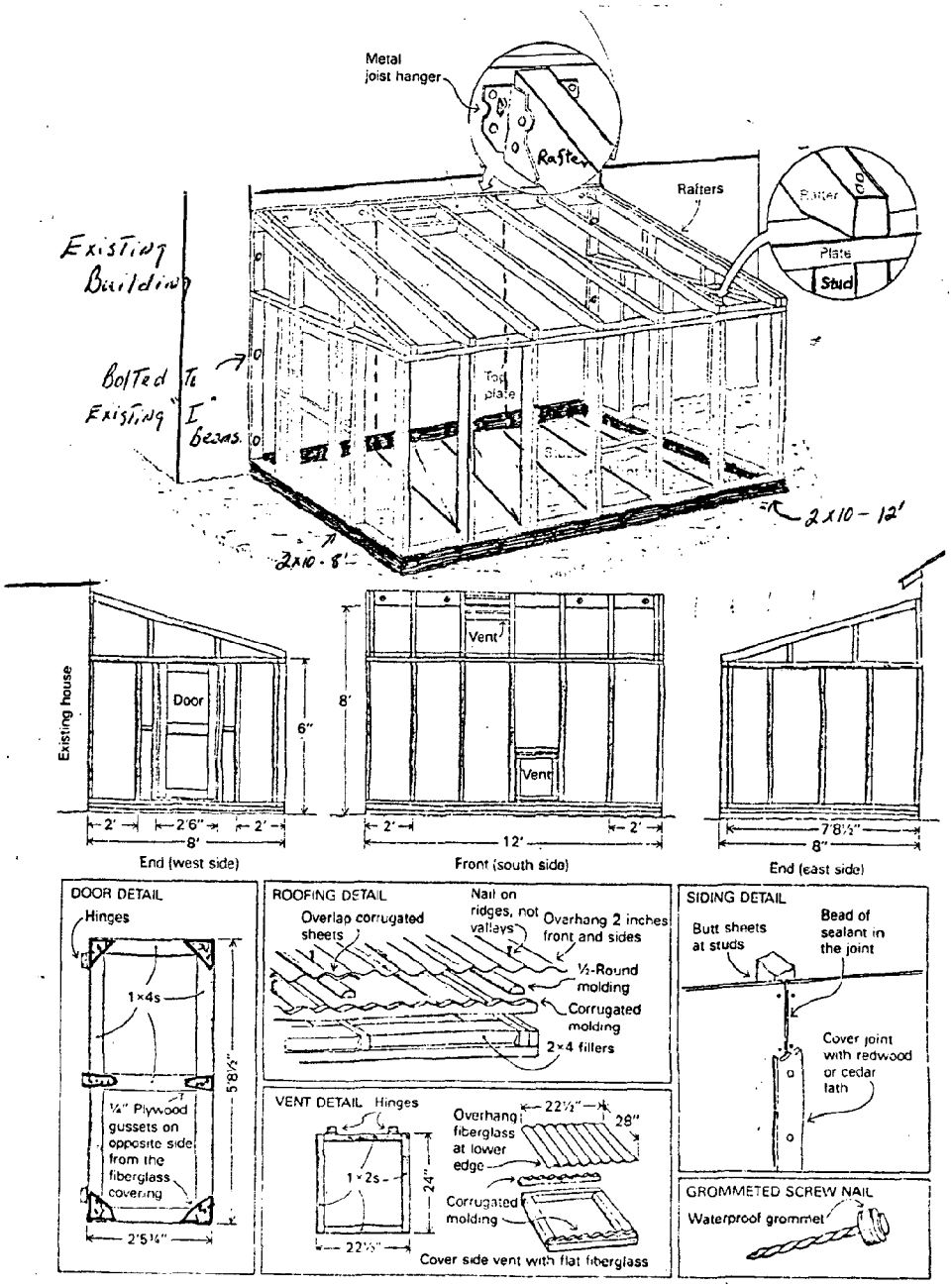
Day Lillies, a hearty survivor of extreme conditions, would also add color and shelter for critters. In addition they provide a lower ground cover.

Each of these plants would be propagated at Westlake in the greenhouse.

C. Greenhouse Plan

A great deal of time in this project was spent identifying the various plant species found in the area. The construction of a greenhouse on the south side of the glass hallway would enable us to better study these plants and the ways they adopt to environmental changes. This greenhouse will also enable us to grow plants indigenous to this area for use as camouflage for the natural gas well. Most of these plants would otherwise not be available for our use.

The following plan illustrates the type of greenhouse that will be constructed within the courtyard of the school.



V. Future Activities (Grade 6)

Because of the shortage of time left in the school year when the project began and curriculum guideline that had to be completed, the 6th grade was unable to participate in the project. The following activities conducted by the 6th grade science classes will utilize the wetlands area at Westlake.

A study of meteorlogical conditions in the area will be conducted. Weather conditions will be monitored daily through out the year. The platform will serve as the base for the weather station. Readings will be plotted and generalization about weather changes made based on the data collected.

Students will also use the wetlands area to investigate adaptation made by various plants and animals to the environmental conditions found in the wetlands. Adaptation caused by changes in climatic conditions will also be investigated.

One problem that has existed along the lakeshore is erosion caused by the wave action of the lake, and deep gully erosion by small streams draining into the lake. A small stream, caused by an artesian spring, originates in our wetlands areas. The students will stake out the stream bed using stakes made from treated lumber. A reference point will be placed on the stake and the distance from the reference point to the bottom of the stream bed measured. Stakes will be placed at specific intervals along the stream and a profile of the stream bed established. At each stake students will also measure and record the velocity of the stream at that point. A comparison profile will be made in late Spring. Students can then discuss what areas of the stream erode fastest, what factors cause this increased erosion, and what possible measures, if any, could be tried to reduce the erosion.

Even though the 8th grade science program has played a rather large part in the investigation of the proposed study area, there are some further investigations which will be instituted.

In the Fall of the year all of the 8th grade students shall be involved with a complete entomology study of the area. The study shall involve collecting and identifying as many species as possible. The specimens shall be then mounted and preserved for future studies of entomology and the overall ecology of the area.

Other relative activities that shall be used in relationship with the current science curriculum can be found in the following pages.

A. Lentus Life Study

Objectives:

1. After you have collected and observed the life of the swamp and the life of a man-made pond, you will be able to draw some conclusions as to the different life systems, and compare and contrast each.

2. You will be able to identify all of the life viewed at the field sites, and also the life discovered beneath the microscope.

3. You will construct a map of each of the field sites, and label the positions from which you have extracted your samples or done your observations.

4. You shall construct a food web for each of the field sites, showing the producers, primary consumers, and secondary consumers.

5. Each group shall construct their own artifical environmental for study in the lab.

Study Guide

Physical Characteristics:

1. Construct a map of the pond, labeling all areas that were used in sampling or observation.

2. Sample the temperature of the water, both the air temperature above the surface and the water temperature.

3. Can you explain how this pond is supplied with water. Construct a diagram to illustrate your answer.

4. What is the turbidity of the pond?

5. Compute an average depth for each pond.

6. What do you believe to be the approximate water capacity of this pond?

7. Do you believe it to be polluted? If you believe it to be, what evidence can you state to support your views.

Biological Guide

1. What signs of life do you see on the surface? In the water along the shore? In deeper water? In the air over the water? At the waters edge?

2. On what are the life forms feeding? Why do you think so? Scoop up a jar of water. Look at it with a microscope. What signs of life do you see? Where do these fit into the food web of this pond? What would happen if we stocked the pond with fish? If we did, what species would survive the best?

Biological Guide (cont.)

3. Scoop up a jar of mud from the bottom and examine it. Examine decaying vegetation and undersides of the leaves of any water plants. Examine the algae under the microscope. Where do these organisms fit into the food web? Are they part of the web only if they are eaten? Why do you say this? What do you suppose they eat?

4. Do any birds seem to be getting food from the water, or because of the water? What would happen if there were no birds?

5. Are any animals feeding directly on plants? What did you observe that made you think this?

6. Where do the plants get their food?

7. Does the life of the pond contribute in any way to the plants life? How?

8. What are the producers in the pond? What are some of the primary consumers? Secondary consumers?

B. Stream Life Lab

Objectives:

1. To develop an understanding of the fast flowing stream as a habitat, i.e. as a place to live.

2. To observe the advantages and disadvantages enjoyed and suffered by organisms in this environment.

3. To observe the adaptation of the organisms for life in the stream.

Suggestions for Study

Work in your assigned teams. Designate one member as a recorder and then work closely together to insure that all collections of specimens are promptly and properly labeled and all field data are clearly entered. To aid in the recording of data make a map sketch of the portion of the stream studied with locations of rapids, quiet back waters, major eddies, and prominent landmarks indicated. The location of samples may then be indicated on this sketch.

Physical-Chemical Information

1. Velocity of flow = Get an indication of the distribution of velocities in the stream by timing movement of water, by floating a wood chip. (Repeat 3-4 times and average). How does the velocity change with depth, width of stream, obstacles in the stream.
2. Light Penetration = What parts of the stream are shaded? What areas will be unshaded in all seasons?

3. Temperature = Take the air temperature and water temperature at station. Are these temperatures related to 1 and 2 above?

4. Oxygen concentration = Collect samples of water surface and bottom and analyze for oxygen as demonstrated.

Biological Information:

Collect samples of all biological materials found at your station. In this collection be sure to include samples of all filamentous algae attached to rocks, stumps, and other vegetation. Scrape rocks and stones to secure samples of encrusting diatoms and other members of the "Aufwuchs." A variety of aquatic insect larvae will be found in tubes attached to rocks, or crawling on the rocks, or partially buried among the debris. In the rapids work in pairs and as rocks are turned over or disturbed one member of the group should hold a hand net down stream to collect dislodged materials. Use a screen on samples of sediments and debris where they have collected. Be on the alert for fish, amphibians, particularly in the quiet backwaters and the tributary brook. Take a plankton sample from your station.

C. Stream Study Lab I: Stream Flow and Economy

1. To begin your stream lab, let us visit the bank of a typical river and watch its activities. What do we see that sets a river aside from other bodies of water?

   A.

   B.

   C.

   D.

2. What creates the power of this stream?

3. Choose a section of this stream to conduct your experiments. By the use of a meter stick construct a map of your station. On the map should be placed any information pretaining to the conducting of this lab.

4. Can you determine the discharge of water from this stream? (The discharge of a stream is the quantity of water passing a given point in a unit of time.) Write a summary of how you determined the answer you did. To help you in your calculations perhaps you might like the following formula for determining the discharge of a stream.

   Discharge = width x depth of channel x velocity of the stream

   Remember that discharge is usually expressed in cubic feet per second.

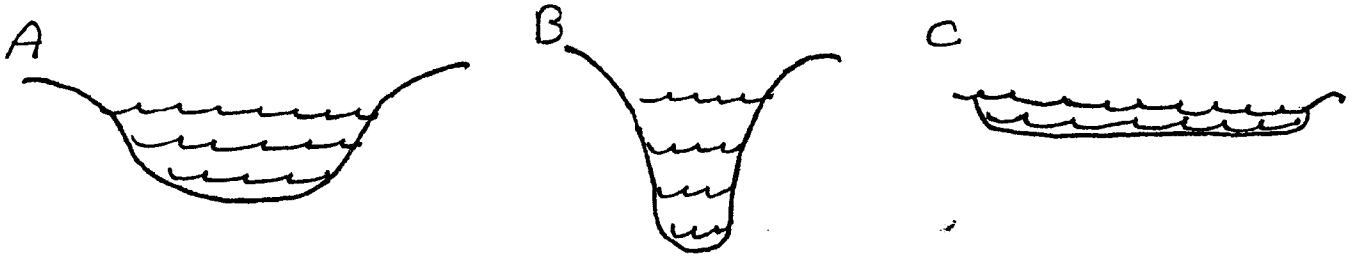
   Materials needed for this experiment:

   1. meter stick
   2. length of rope
   3. wood block
   4. watch

5. What seems to be the gradient or slope of this stream? Use the contour map of this area to determine your answer; be sure to express your answer in feet per mile. Sketch the basic gradient of this stream in the space provided.

6. Sketch the basic shape of the stream channel. Now that you have determined the basic cross-section of your stream, let's consider the following quotation.

> "It can be proven mathematically that the channel of semicircular cross section A exerts less friction against the moving water because its rubbing surface per unit area is less than that of either B or C. Water flowing in a deep and narrow channel drags against the walls and tends to widen them by erosion. Water flowing in a wide but shallow stream drags against the bottom and is so slowed, particularly along the shallowest margins, that deposition of material carried by the stream is likely to occur on these margins, narrowing the channel and deepening its central part."



Explain how the channel of your stream has been effected by its shape.

7. Is the velocity of the stream the same through out its entire channel? Place some red dye in three places across the stream. How does the dye move? What does this tell you about the streams movement?

8. Streams carry 3 basic varieties of loads. By using the stream at hand, determine the 3 types of load carried by this stream. What type of material is carried by each variety of stream load? In what part of the stream do you find each of the loads being carried?

9. The maximum size of particles that a stream can move under a particular set of conditions is defined as the competence of the stream. Can you determine the competence of your sample stream?

D. Stream Lab II: Geologic Activities - Erosion and Deposition

Up to this point we have examined streams in order to try to understand their flow and economy. Now we are ready to examine their geologic activities.

1. Now that you are familiar with the stream in our study, let's list the three basic geologic activities of this stream.

   A.

   B.

   C.

2. One of the most important of the geologic activities of this or any stream is erosion. Erosion in a stream can operate by (3) basic means; hydraulic action, abrasion, and solution. Give at least (1) example of each of these methods of erosion in action in the stream. Show on the map where each is taking place.

3. Another activity of this stream is transport. We have already discussed and worked with transport in regards to stream load, but there is still some investigations to be done.

   A. Take some samples from the bottom of the stream. Can you identify the rock type? By using a geologic map of the area can you retrace the origin of your sediment samples.

   B. Which of these (3) stream loads is carrying the greatest amount of sediments. Provide an explanation as to why you believe your answer to be correct.

   C. Of what size are most of the sediments carried by this stream? To help you in your investigations refer to chart 2-1 at the back of this lab.

4. The third activity of this stream is deposition. Let's investigate the deposition of our stream.

   A. Where is most of the deposition of this stream taking place? Can you provide a reason as to why your answer is correct?

   B. When we look at our stream in regards to deposition, we notice that where there are curves in the stream channel we usually find deposition occuring.

      1. Can you determine where most of this deposition is taking place?

      2. Provide a solution as to why these deposits seem to be always found occuring in the same situation.

5. Can you find evidence along the banks of this stream where erosion and deposition have occurred, but are not in contact with the present stream channel? List as many as you can find, and try to provide an explanation for its occurrence.

E. Soil Lab: Find out how much alive soil is.

Procedures:

1. Take three large, heavy paper shopping bags, a ruler, a small spade, and 6 or more small bottles with lids or corks. A small magnifying glass will also be helpful.

2. Measure off an area 1 foot square and collect the soil to a depth of 2-3 inches from each of the following places.

   A. Below the leaves in an ungrazed and unburned woodland.--Deciduous

   B. Grass/Lawn

   C. Heavy Humas Deposit Around Swamp Areas

   D. Coniferous Forest

3. As you remove the soil watch for burrows of worms and other animals. You may also find the eggs of certain insects singly or in masses.

4. Pour out the samples on separate sheets of paper the size of an open newspaper.

5. Carefully sort the soil, watching closely for small living things.

6. Place the different kinds of animals in separate bottles.

7. Count the animal life belonging to each of the following groups:

   A. Worms (such as earthworms or night crawlers having no legs)

   B. Grubs (any wormlike animal with legs)

   C. Snails (snails without shells are called slugs)

   D. Insects (any hard-shelled, soft-bodied, or winged animal with 3 pair of legs)

   E. Spiders, mites, ticks (animals with 4 pair of legs)

   F. Animals with more than 4 pair of legs

   G. Others (any animal not falling into one of the above groups)

Questions:

1. Which soil sample has the most animal life? Why?

2. Can you see any relationship between the rate these soils absorbed water and the amount of life they support?

3. Does the amount of animal life and the burrows the animals make appear to have any relationship to the looseness of the soil? Explain your answer.

4. Figure the total number of each animal group per acre for each of the sampled areas. (There are 43,560 sq. ft. in an acre) Also figure the grand total of all the animals for 1 acre.

   No matter how large the total number of visible animals you find in the soil, it is small compared to the number of microscopic plants and animals, particularly bacteria, present. Check out the presence of microscopic life in the soils by taking a sample of each of the sampling grasses back to the lab and analyze it under a microscope, noting the different life forms.

   1. Draw at least 5 of the microscopic life forms you have located in the soil.

   2. How do these life forms seem to affect the soils.

   3. Which of the soils seems to have the greatest microscopic population? Why?

   4. Can you estimate by the previous method the total number of microscopic life found in an acre?

POPULATION STUDY

Any school which has a lawn can do population studies using dandelions or plantain as study organisms. Bend a coat hanger into a circle one foot in diameter, or make a square measuring one foot on a side. These should be thrown at random into the test area a specified number of times (i.e. 10 times for 100 foot plot). The more samples the greater the probability of accuracy. Record the number of the test organisms found inside the circle or square. The probable number of test plants in the whole plot can then be calculated. This figure can be checked by involving the whole class in an actual count of the test organism in the large plot. A comparison of the average of a number of statistical estimates with an equal number of actual counts will give an indication of statistical accuracy.

G. Field Mathematics Lab.

Objectives:

1. To measure the heights of several trees using the Biltmore stick principle.

2. To measure the diameters of several trees by using a diameter tape and a Biltmore stick.

3. To measure the distance between several trees randomly selected within an area and find the average distance between the trees.

4. To estimate and measure a slope.

5. To step off an equilateral triangle using only a compass with the best possible accuracy.

6. To sight contour.

7. To estimate and measure off an acre.

Concepts:

1. The Biltmore stick makes use of geometric principles of triangulation in finding the height.

2. Each unit on the Biltmore stick is equivalent to 16 ft. of tree height at 66 ft. from the tree, and each Biltmore is equivalent to 6.15 inches.

3. By averaging the random sampling of tree heights in a certain area, one should obtain an approximation of the average tree height for that area.

4. By averaging the random sampling of tree diameters, one should obtain an approximation of the average diameter of the trees for the area from which they were selected.

5. By averaging the random sampling of distances between trees, one should obtain an approximation of the average distance between trees of the immediate area.

6. Slope is expressed in percentage.

7. The per cent of slope equals $\frac{\text{rise}}{\text{run}} \times 100$.

8. Each angle in an equilateral triangle is equal to 60 degrees.

9. The compass points toward magnetic north.

10. Compasses are calibrated in degrees and the entire circle from North back to North is 360 degrees.

11. Contour planning is often used in road building, farming, and many other areas.

12. Land areas are often measured in acres, especially farms, forests, and parks.

Vocabulary:

1. Biltmore Stick--a stick marked off in units of 1,2,3....with each unit equivalent to 16' of tree height at a distance of 66' from the tree.
2. Diameter Tape--a device for measuring the diameter of a tree.
3. Rise--any vertical distance.
4. Run--any horizontal distance.
5. Slope--the inclination of a plane.
6. Plane--any flat, two-dimentional surface.
7. String or line level--a level which can be attached to a piece of string and used to level two strings.
8. Equilateral Triangle -- any triangle where all three sides or all three angles are equal.
9. Contour--a line connecting the points on a land surface that have the same elevation.
10. Chain--length of chain made of #6 to #9 wire made up of one hundred links equal to 66 feet.
11. Acre--any acre equivalent to 10 square chains; 43,560 sq. ft.

Materials:

1. Biltmore sticks
2. Diameter Tape
3. String
4. Meter stick
5. string or line level
6. Compasses
7. Stakes
8. Sight Levels
9. Rope 66'

Procedures:

1. Tree Estimation
   A. How tall is the tree?
   B. What is the tree's diameter?
   C. What is the average distance between the trees? The average diameter? The average height?
2. Slope and Equilateral Triangle
   A. What is the percentage of slope?
   B. By the use of a compass; pace and stake out an equilateral triangle.

3. Contour and Acre estimate

   A. By the uses of a chain or rope 66' in length, estimate an acre, and stake it off.

   B. After you have established your acre, construct a contour map of the acre.

H. Measuring The Diameter of the Sun

Materials:

1. Meter Stick (1)
2. Boards; one 8" x 10"; one 4" x 6"
3. Sissors (1 pair)
4. Drawing Compass (1)

Procedure:

This investigation is best done with one or two partners. The meter stick and cards are to be assembled as shown in the diagram in this investigation. Cut slots in each of the cards, in the position shown, so that the meter stick can fit through them. They should be a little smaller than the width and breadth of the meter stick, so that it fits the slots tightly. Draw an eight millimeter circle on the smaller card. Make a small hole in the other card, as shown, with the point of the drawing compass. The center of the circle and the pinhole should be approximately the same distance above the meter stick slots.

Place the cards on the meter stick with the pinhole card at the zero end. Aim the zero end of the meter stick at the sun. (DO NOT LOOK AT THE SUN AS YOU MAY DAMAGE YOUR EYES). MOve the stick around until the shadow of the pinhole card covers the card with the circle on it. Move the circle card toward the pinhole card until you can see the bright dot of light formed by the pinhole. (1) Of what is this the image? The cards should not flop over but should be kept perpendicular to the meter stick.

Now carefully move the circle card away from the pinhole card until the bright image just fills the circle. (2) Why does the image get larger?

When the bright image just fills the circle, measure (to the nearest millimeter) the distance between the pinhole and the circle.

Remember how the diameter (centimeters), of the bright image increased as the distance, l (centimeters), between the circle card and the pinhole card increased? Suppose that the distance from the earth to the sun is L (centimeters) and that the diameter of the sun is D (centimeters). Can you see how the ratio $\frac{D\ (cm)}{L\ (cm)}$ equals the ratio $\frac{d\ (cm)}{l\ (cm)}$?

$$\text{THEN } \frac{D(cm)}{L(cm)} = \frac{d\ (cm)}{l\ (cm)}$$

(3) Why are the ratios equal? (Draw a diagram) Solve the equation for D. (4) What measurements are needed to calculate D? (5) How can the distance L be measured? (6) What is the value of L given in Chapter 4 of the Earth Science text? (7) What is L in centimeters? Use the measurements you have

made and the value of L in centimeters to calculate the sun's diameter, D. (8) What are the units of this value of D? (9) What is the value of D in kilometers?

I.

SPLASH EROSION

Beating rain breaks up the surface of the soil before carrying it away. To show splash erosion, prepare two boards 18" long, 4" wide, 1/2 inch thick. Point one end to drive in soil. Nail tin 4" by 5" as a roof to the unpointed end of the board.

Drive two boards into the ground, into two locations with two different kinds of cover. After a rain, compare the amount of soil splashed onto each board and the height the splasher reached.

Improve the splash board by tacking 2 inch strips of blotting paper to the splashboards. A permanent record can be made of the splashing.

COASTAL ZONE MANAGEMENT PROJECT

FEASIBILITY AND SITE DESIGN FOR THE
PRESERVATION OF WESTLAKE AREA SWAMP/WETLANDS

-PROGRESS REPORT-
OCTOBER 8, 1982

Phase II and Phase III of the Westlake CZM Project overlapped during the spring and summer months of 1982. The following report describes what was accomplished and the future implementation plans.

WHAT WAS DONE:

APRIL, MAY, JUNE, 1982:

1. Identification of plants and animals began. Westlake eigth grade students (during seventh period activity) started mapping out the area and established random quadrants throughout the study zone.

2. Videotaping was done by students in the activity period from the beginning of the Indentification Phase.

JULY, AUGUST, SEPTEMBER, 1982:

1. Identification continued and the Site Design was developed during a two week summer workshop in July. The purpose of the workshop was to complete the findings started during the school year, and then to develop a design for preserving the area as a basic natural environment. The students created the basic plan for the area by using a simple mapping technique of using a compass and steel tape. Readings and distances were plotted on a map. A trail was mapped in encompassing point of interest using the same technique.

2. Student videotaping continued throughout the workshop. A complete videotape was produced after editing, an introduction added, and a narration included.

3. The two project instructors developed and presented a series of four two-hour workshops for Millcreek teachers teaching grades 4-8. The workshops focused on making science (using the CZM area) interdisciplinary. Math, Social Studies, Language Arts, and

and Science workshops were held.

4. Dr. David Gustatson, Professor of Ecology, Villa Maria College, consulted with Westlake CZM instructors on the Greenhouse Plan (Research Hut) and future alternate energy plans (wind system).

5. The Site Design was completed after the wetlands area was investigated and the habitat identified a basic lay out of a nature area was developed. The plan will be put into operation within a year including all Westlake property and will be expanded to its full extent upon permission from the adjacent land holder.

   There are nine stations along the trail design that indicate various points of interest throughout the four major areas of vegetation. The trail, was designed to incorporate all the different elements of the habitat found within the perimeter of the designated area.

   The trail will be cut to approximately four feet in width and constructed of bark and corduroy road.

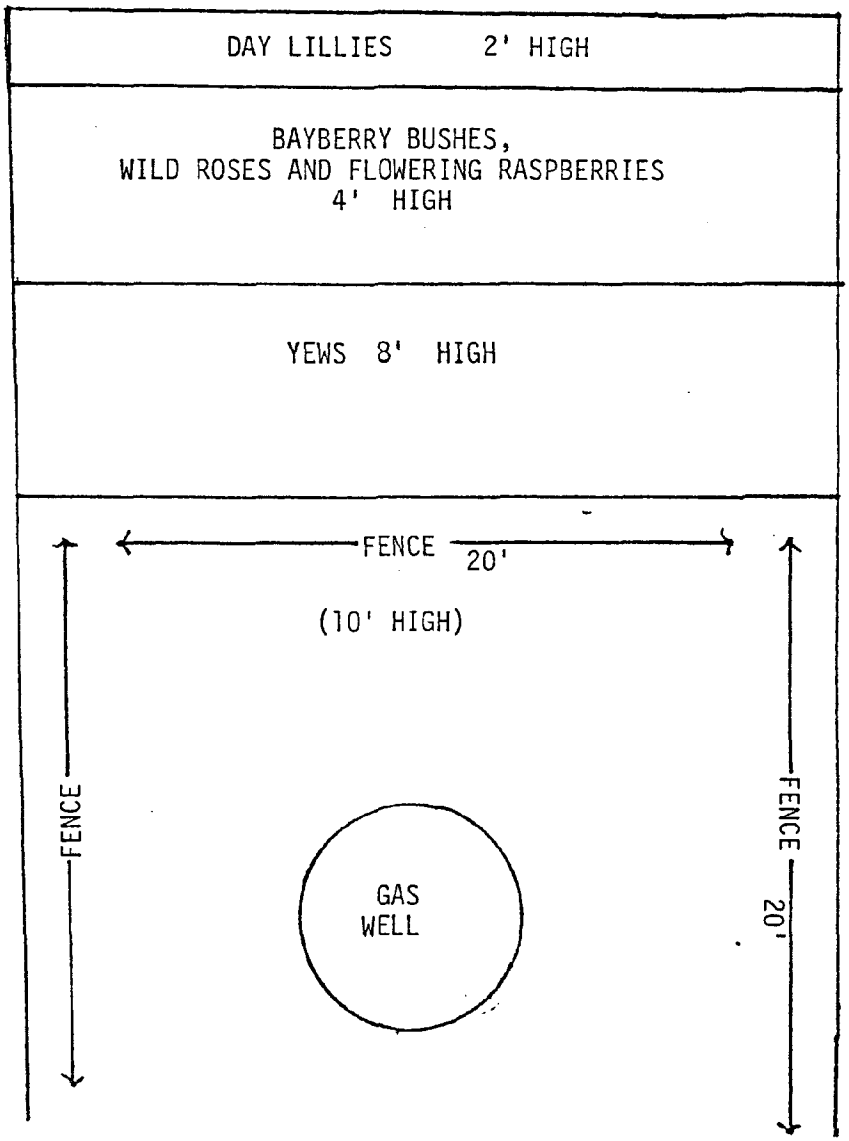
   The nature area will be used for educational purposes for middle school students and any other interested comunity group such as Audubon.

6. GIS well camouflage plan was implemented.

   In the fall of 1981 Millcreek School District drilled a natural gas well (medina level) based upon recommendations from a study completed by DOE and Monsanto Corporation. The well is located at Westlake Middle School adjacent to the wetlands, approximatels 100 feet west of the area.

   With new energy sources and alternatives being, investigated, it is an environmental priority to preserve the natural habitat. One outcome of this project was to develop and implement a plan to camouflage or alter the physical presence of the gas well to complement the environment.

   The following diagram illustrates the plan using plants indigenous to the area for maintaining a year round ground cover.



7. The research hut was completed.

A great deal of time in this project was spent identifying the various plant species found in the area. The construction of a greenhouse on the south side of the glass hallway enabled us to better study these plants and the ways they adopt to environmental changes. This greenhouse also enabled us to grow plants indigenous to this area for use as camouflage for the natural gas well.

IMPLEMENTATION PLAN:

1. Grade 6 Student Involvement.

   Because of the shortage of time left in the school year when the project began and curriculum guideline that had to be completed, the 6th grade was unable to participate in the project. The following activitied conducted by the 6th grade science classes will utilize the wetlands area at Westlake.

   A study of meteorlogical conditions in the are will be conducted. Weather conditions will be monitored daily throughout the year. The platform will serve as the base for the weather station. Readings will be plotted and generalization about weather changes made based on the data collected.

   Students will also use the wetlands area to investigate adaptation made by various plants and animals to the environmental conditions found in the wetlands. Adaptation caused by changes in climatic conditions will also be investigated.

   One problem that has existed along the lakeshore is erosion caused by the wave action of the lake, and deep gully erosion by small streams draining into the lake. A small stream, caused by an artesian spring, originates in our wetlands areas. The students will stake out the streambed using stakes made from treated lumber. A reference point will be placed on the stake and the distance from the reference point to the bottom of the streambed measured. Staked will be placed at specific intervals along the stream and a profile of the streambed established. At each stake students will also measure and record the velocity of the stream at that point. A comparison profile will be made in late Spring. Students can then discuss what areas of the stream erode fastest, what factors cause this increased erosion, and what possible measures, if any, could be tried to reduce the erosion.

2. Grade 8 Student Involvement.

   Even though the 8th grade science program has played a rather large part in the investigation of the proposed study area, there are some further investigations which will be instituted.

   In the Fall of the year all of the 8th grade students shall be involved with a complete entomolgy study of the area. The study shall involve collecting and identifying as many species as possible. The specimens shall be then mounted and preserved for future studies of entomology and the overall ecology of the area.

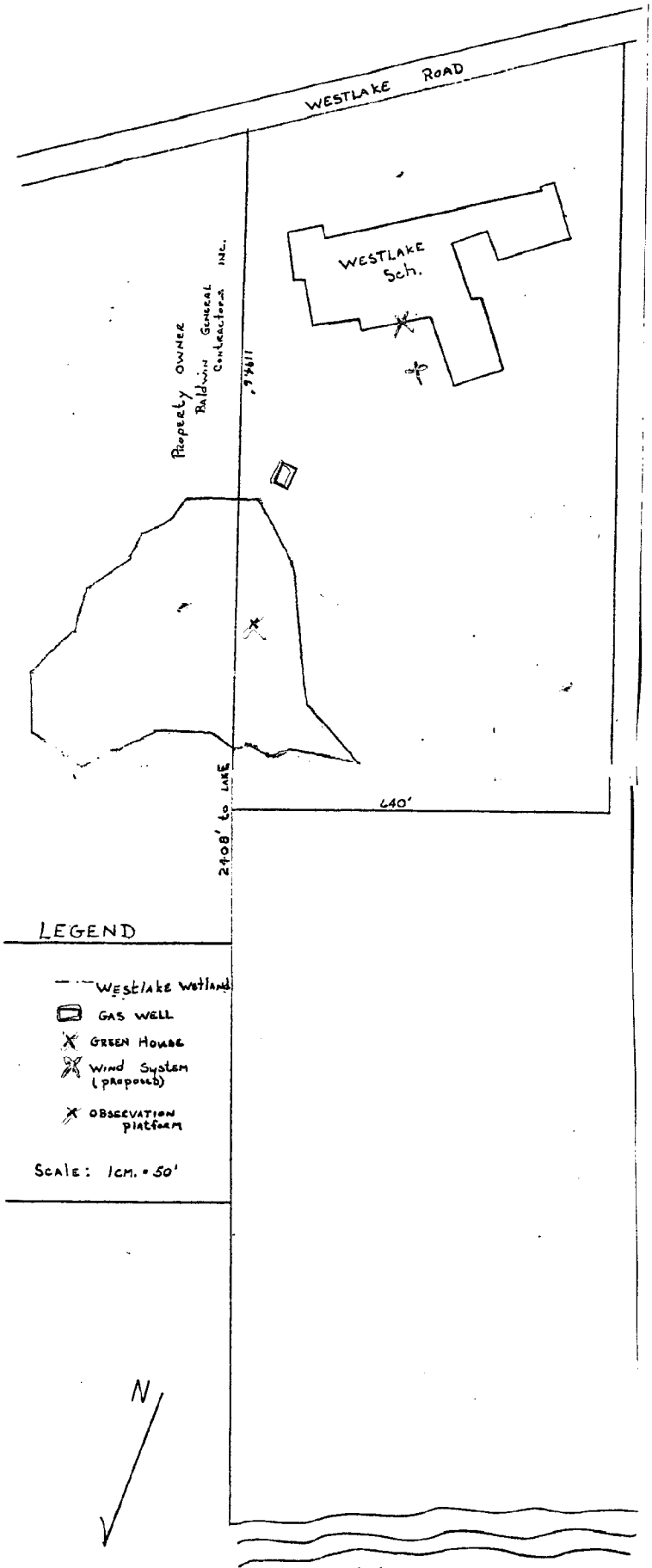
3. The Possibility of a Wind System will be investigated and erected upon Board approval. This possibility exists because the school district has an energy loan and this project is eligible.

4. The site design plans will be underway this fall. The following tasks will be conducted througout the year.

    a. Instructors will attempt to acquire adjacent property from Mr. Baldwin to use for educational purposed through donation. If property cannot be acquired, the possibility of using the land will be attempted.

    b. Regualr meetings with Asbury Woods Nature Center and Millcreek Parks and Recreation will take place for planning the actual timeline for developing the nature center. The target date for completion is summer 1983.

Shelley Ford
Coordinator


WESTLAKE ROAD
WESTLAKE Sch.
Property OWNER
Baldwin General Contractors Inc.
1,956'
640'
2408' to LAKE
LEGEND
Westlake wetland
GAS WELL
GREEN HOUSE
Wind System (proposed)
OBSERVATION platform
Scale: 1cm. = 50'
N
LAKE ERIE